Application No. 10/027,906

AMENDMENTS TO THE CLAIMS

A detailed listing of all claims that are, or were, in the present application, irrespective of whether the claim(s) remains under examination in the application are presented below. The claims are presented in ascending order and each includes one status identifier. Those claims not cancelled or withdrawn but amended by the current amendment utilize the following notations for amendment: 1. deleted matter is shown by strikethrough for six or more characters and double brackets for five or less characters; and 2. added matter is shown by underlining.

1. (Canceled)

2. (Previously Presented) The optical structure of claim 5 wherein at least one of the plurality of layers comprises silicon oxide glass.

3. (Original) The optical structure of claim 2 wherein the silicon oxide glass comprises at least one dopant.

4. (Previously Presented) The optical structure of claim 5 wherein at least one of the plurality of layers comprises aluminum oxide, titanium oxide, telluride glasses, phosphate (P_2O_5) glass, InP, lithium niobate, combinations thereof and doped compositions thereof.

5. (Currently Amended) An optical structure comprising a plurality of layers with at least two layers having composition variation within each layer, the at least two layers comprising a first layer and a second layer and the plurality of layers comprising a first turning element being at least partially located within the first layer and the second layer wherein the first turning element reflects light between a confined optical pathway within the plane of the first layer and a confined optical pathway within the plane of the second layer wherein the first layer comprises a

plurality of optical devices integrated within the first layer, wherein the confined optical pathway within the plane of the first layer comprises an inorganic optical glass.

6. (Original) The optical structure of claim 5 wherein the second layer comprising a plurality of optical devices integrated within the second layer.

7. (Original) The optical structure of claim 5 wherein at least one of the integrated optical devices of the first layer is selected from the group consisting of optical waveguide/conduit, optical attenuator, optical splitter/coupler, optical filter, optical switch, laser, modulator, interconnect, optical isolator, optical add-drop multiplexer (OADM), optical amplifier, optical polarizer, optical circulator, phase shifter, optical mirror/reflector, optical phase-retarder, optical detector, an electrode contact, an optical grating and combinations thereof.

8. (Original) The optical structure of claim 5 wherein the plurality of layers further comprises a thermal conductive layer, a stress reducing layer, an electrical conducting guide or a combination thereof.

9. (Previously Presented) The optical structure of claim 5 wherein the at least two layers form an integrated optical circuit comprising a plurality of optical devices located on different layers comprising the first layer and the second layer, the first turning element forming a light pathway from the first layer to the second layer and the optical devices being functionally integrated between the different layers by the first turning element.

10. (Original) The optical structure of claim 9 wherein the at least two layers comprises a third layer, the at least three layers comprising a second turning element, the second turning element deflecting light from within the second layer to the third layer to functionally integrate optical devices within the second layer and the third layer.

11. (Original) The optical structure of claim 9 wherein the first turning element optically connects a first planar waveguide in the first plane with a second planar waveguide in a second plane.

12. (Previously Presented) The optical structure of claim 5 wherein the first turning element comprises an angled mirror.

13. (Original) The optical structure of claim 12 wherein the angled mirror is formed by an angled surface of a waveguide forming an interface with a lower index-of-refraction material.

14. (Original) The optical structure of claim 13 wherein the lower index-of-refraction material comprises a fluid.

15. (Currently Amended) The optical structure of claim [[12]] <u>13</u> wherein the lower index-of-refraction material comprises a glass.

16. (Currently Amended) The optical structure of claim [[12]] <u>13</u> wherein the lower index-of-refraction material has an index-of-refraction at least about a factor of 1.3 lower than the index-of-refraction of the waveguide material.

17. (Currently Amended) The optical structure of claim [[12]] <u>13</u> wherein the lower index-of-refraction material comprises an electro-optical material that has an index-of-refraction that is controlled by one or more electrodes that correspondingly turn the mirror on and off.

18. (Currently Amended) The optical structure of claim [[12]] <u>13</u> wherein the lower index-of-refraction material comprises a thermo-optical material, the structure further comprising a thermal transmission region adjacent the thermo-optical material.

19. (Original) The optical structure of claim 12 wherein the angled mirror comprises an angled surface of a waveguide having an interface with a metal.

20. (Original) The optical structure of claim 12 wherein the angled mirror comprises alternating layers of material with different indices-of-refraction.

21. (Original) The optical structure of claim 12 wherein the first turning element further comprises a second angled mirror along an optical pathway formed from the first angled mirror wherein the second angled mirror optically connects an optical pathway in a second layer with the first angled mirror.

22. (Previously Presented) The optical structure of claim 5 wherein the first turning element comprises an optical taper forming an optical pathway of a higher index-of-refraction materials surrounded by a cladding material with a lower index-of-refraction wherein the optical pathway involves a gradual turn from the first layer out of the plane of the first layer.

23. (Previously Presented) An optical structure comprising a plurality of layers with at least two layers having composition variation within each layer, the at least two layers comprising a first layer and a second layer and the plurality of layers comprising a turning element being at least partially located within the first layer wherein the turning element comprises an optical taper forming an optical pathway of a higher index-of-refraction material surrounded by a cladding material with a lower index-of-refraction wherein the optical pathway involves a gradual turn from the first layer out of the plane of the first layer.

24. (Original) The optical structure of claim 23 wherein the taper is optically connected to a first planar waveguide in the first layer and a second planar waveguide in the second layer.

25. (Original) The optical structure of claim 24 wherein the optical taper, the first planar waveguide and the second planar waveguide have approximately the same index-of-refraction.

26 - 125. (Canceled)

126. (Original) An optical device comprising a first cladding layer of optical material, a second cladding layer of optical material and a core of optical material, which is adjacent the first cladding layer and the second cladding layer and which has a higher index-of-refraction than the cladding layers, wherein one of the cladding layers has a localized band of tap material having an index-of-refraction intermediate between the core layer and the average index-of-refraction of the cladding layer with the localized band intersecting the core material, the tap material providing for the leakage of some light intensity into the tap material when light is transmitted through the core, wherein the core comprises an inorganic optical glass.

127. (Original) The optical device of claim 126 wherein the core forms a coupler/splitter with one optical path being optically coupled to a plurality of optical paths.

128. (Original) The optical device of claim 127 wherein the tap material intersects the plurality of optical paths.

129. (Original) The optical device of claim 126 wherein the tap material is optically integrated with an optical detector.

130. (Original) An integrated optical circuit comprising a vertical cavity surface emitting laser, a planar waveguide and a turning element optically connecting the planar waveguide and the vertical cavity surface emitting laser with emissions being directed approximately perpendicular to the plane of the waveguide.

131. (Original) The integrated optical circuit of claim 130 wherein the turning element is a mirror.

132. (Original) The integrated optical circuit of claim 130 wherein the turning element is a taper.

133. (Original) The integrated optical circuit of claim 130 wherein the turning element is a photonic crystal.

134. (Canceled)

135. (Canceled)

136. (Original) A continuously variable optical attenuator comprising a first cladding layer; a second cladding layer that is thermally conductive; a third cladding layer; a pump-core adjacent to the second cladding layer and the third cladding layer, the pump core having an index-of-refraction higher than the second cladding layer and the third cladding layer and the pump-core comprising an absorption region that absorbs a selected region of the electromagnetic spectrum, and an active-core between the first cladding layer and the second cladding layer, the active core comprising a thermally sensitive region adjacent at least a portion of the absorption region, the thermally sensitive region comprising a material having an index-of-refraction that varies with temperature.

137. (Previously Presented) A continuously variable optical switch comprising an interferometer having two coupled waveguides that join at a directional coupler, one of the coupled waveguides comprising a continuously variable optical attenuator of claim 136.

138. - 141. (Canceled)

142. (Currently Amended) A planar optical circuit comprising a monolithic optical structure having a first optical device and a second optical device, the first optical device and second optical device being optically connected by a free space optical element embedded within the monolithic optical structure wherein the first optical device comprises an inorganic optical glass.

143. (Original) The planar optical circuit of claim 142 wherein the free space optical element is located in a trench within the monolithic structure between the first optical device and the second optical device.

144. (Original) The planar optical circuit of claim 143 wherein the trench is filled with a liquid.

145. (Original) The planar optical circuit of claim 143 wherein the trench is filled with a polymer.

146. (Canceled)

147. (Canceled)

148. (Previously Presented) The optical structure of claim 23 wherein at least one of the plurality of layers comprises silicon oxide glass.

149. (Previously Presented) The optical structure of claim 148 wherein the silicon oxide glass comprises at least one dopant.

150. (Previously Presented) The optical structure of claim 23 wherein at least one of the plurality of layers comprises aluminum oxide, titanium oxide, telluride glasses, phosphate (P_2O_5) glass, InP, lithium niobate, combinations thereof and doped compositions thereof.

151. (Previously Presented) The optical structure of claim 23 wherein the higher index-of-refraction material comprises a silicon oxide glass.

152. (Previously Presented) The optical structure of claim 23 wherein the first layer comprises a plurality of optical devices integrated within the first layer.

153. (Previously Presented) The optical structure of claim 152 wherein at least one of the integrated optical devices of the first layer is selected from the group consisting of optical waveguide/conduit, optical attenuator, optical splitter/coupler, optical filter, optical switch, laser, modulator, interconnect, optical isolator, optical add-drop multiplexer (OADM), optical amplifier, optical polarizer, optical circulator, phase shifter, optical mirror/reflector, optical phase-retarder, optical detector, an electrode contact, an optical grating and combinations thereof.

154. (Previously Presented) The optical structure of claim 23 wherein the plurality of layers further comprises a thermal conductive layer, a stress reducing layer, an electrical conducting guide or a combination thereof.

155. (Previously Presented) The optical structure of claim 23 wherein the at least two layers form an integrated optical circuit comprising a plurality of optical devices located on different layers comprising the first layer and the second layer, the turning element forming a light pathway from the first layer to the second layer and the optical devices being functionally integrated between the different layers by the turning element.

156. (Previously Presented) The optical structure of claim 23 wherein the cladding material has an index-of-refraction at least about a factor of 1.3 lower than the index-of-refraction of the higher index-of-refraction material.

157. (Previously Presented) The optical device of claim 126 wherein at least one of the layers comprises silicon oxide glass.

158. (Currently Amended) The optical device of claim [[147]] <u>157</u> wherein the silicon oxide glass comprises at least one dopant.

159. (Previously Presented) The optical device of claim 126 wherein at least one of the plurality of layers comprises aluminum oxide, titanium oxide, telluride glasses, phosphate (P_2O_5) glass, InP, lithium niobate, combinations thereof and doped compositions thereof.

160. (Previously Presented) The optical device of claim 126 wherein the core layer comprises a silicon oxide glass.

161. (Previously Presented) The optical device of claim 126 wherein the core layer further comprises a plurality of optical devices integrated within the first layer.

162. (Previously Presented) The optical device of claim 161 wherein at least one of the integrated optical devices of the core layer is selected from the group consisting of optical waveguide/conduit, optical attenuator, optical splitter/coupler, optical filter, optical switch, laser, modulator, interconnect, optical isolator, optical add-drop multiplexer (OADM), optical amplifier, optical polarizer, optical circulator, phase shifter, optical mirror/reflector, optical phase-retarder, optical detector, an electrode contact, an optical grating and combinations thereof.

163. (Previously Presented) The optical device of claim 126 further comprising a thermal conductive layer, a stress reducing layer, an electrical conducting guide or a combination thereof.

164. (Previously Presented) The optical device of claim 126 wherein the average index-of-refraction of the cladding layer has an index-of-refraction at least about a factor of 1.3 lower than the index-of-refraction of the index-of-refraction of the core layer.

165. (Previously Presented) The integrated optical circuit of claim 130 wherein the planar waveguide comprises silicon oxide glass.

166. (Previously Presented) The integrated optical circuit of claim 165 wherein the silicon oxide glass comprises at least one dopant.

167. (Previously Presented) The integrted optical circuit of claim 130 wherein the planar waveguide comprises aluminum oxide, titanium oxide, telluride glasses, phosphate (P_2O_5) glass, InP, lithium niobate, combinations thereof and doped compositions thereof.

168. (Previously Presented) The integrated optical circuit of claim 130 wherein the turning element comprises a silicon oxide glass.

169. (Previously Presented) The integrated optical circuit of claim 130 further comprising a plurality of optical devices integrated with the planar waveguide.

170. (Previously Presented) The integrated optical circuit of claim 169 wherein at least one of the integrated optical devices is selected from the group consisting of optical waveguide/conduit, optical attenuator, optical splitter/coupler, optical filter, optical switch, laser, modulator, interconnect, optical isolator, optical add-drop multiplexer (OADM), optical amplifier, optical polarizer, optical circulator, phase shifter, optical mirror/reflector, optical phase-retarder, optical detector, an electrode contact, an optical grating and combinations thereof.

171. (Previously Presented) The integrated optical circuit of claim 130 further comprising a thermal conductive layer, a stress reducing layer, an electrical conducting guide or a combination thereof.

172. (Previously Presented) The continuously variable optical attenuator of claim 136 wherein the pump core comprises silicon oxide glass.

173. (Previously Presented) The continuously variable optical attenuator of claim 172 wherein the silicon oxide glass comprises at least one dopant.

174. (Previously Presented) The continuously variable optical attenuator of claim 136 wherein pump core comprises aluminum oxide, titanium oxide, telluride glasses, phosphate (P_2O_5) glass, InP, lithium niobate, combinations thereof and doped compositions thereof.

175. (Previously Presented) The continuously variable optical attenuator of claim 136 wherein the active core comprises a silicon oxide glass.

176. (Previously Presented) The continuously variable optical attenuator of claim 136 further comprising a plurality of optical devices integrated with the pump core.

177. (Previously Presented) The continuously variable optical attenuator of claim 176 wherein at least one of the integrated optical devices of the first layer is selected from the group consisting of optical waveguide/conduit, optical attenuator, optical splitter/coupler, optical filter, optical switch, laser, modulator, interconnect, optical isolator, optical add-drop multiplexer (OADM), optical amplifier, optical polarizer, optical circulator, phase shifter, optical mirror/reflector, optical phase-retarder, optical detector, an electrode contact, an optical grating and combinations thereof.

178. (Previously Presented) The continuously variable optical attenuator of claim 136 further comprising a thermal conductive layer, a stress reducing layer, an electrical conducting guide or a combination thereof.

179. (Previously Presented) The continuously variable optical attenuator of claim 136 wherein the pump core has an index-of-refraction at least about a factor of 1.3 higher than the index-of-refraction of the second cladding layer and the third cladding layer.

180. (Previously Presented) The planar optical circuit of claim 142 wherein the first optical device comprises silicon oxide glass.

181. (Previously Presented) The planar optical circuit of claim 180 wherein the silicon oxide glass comprises at least one dopant.

182. (Previously Presented) The planar optical circuit of claim 142 wherein the first optical device comprises aluminum oxide, titanium oxide, telluride glasses, phosphate (P_2O_5) glass, InP, lithium niobate, combinations thereof and doped compositions thereof.

183. (Previously Presented) The planar optical circuit of claim 142 wherein the first optical device is selected from the group consisting of optical waveguide/conduit, optical attenuator, optical splitter/coupler, optical filter, optical switch, laser, modulator, interconnect, optical isolator, optical add-drop multiplexer (OADM), optical amplifier, optical polarizer, optical circulator, phase shifter, optical mirror/reflector, optical phase-retarder, optical detector, an electrode contact, an optical grating and combinations thereof.

184. (Previously Presented) The planar optical circuit of claim 142 further comprising a thermal conductive layer, a stress reducing layer, an electrical conducting guide or a combination thereof.

Please add new claims 185 and 186 as follows:

185. (New) The optical structure of claim 5 wherein the confined optical pathway within the plane of the second layer comprises an inorganic optical glass.

186. (New) The optical structure of claim 185 wherein the confined optical pathway within the plane of the first layer and the confined optical pathway within the plane of the second layer are within a monolithic structure.